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10/678,920	10/02/2003	Shiow-Hwei Hwang	TNCR.210US1	1403

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EXAMINER

DETSCHER, MARISSA

ART UNIT	PAPER NUMBER
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2877

DATE MAILED: 12/13/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

# Office Action Summary

Application No.

10/678,920

Applicant(s)

HWANG ET AL.

Examiner

Marissa J. Detschel

Art Unit

2877

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

## Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

## Status

- 1) ☒ Responsive to communication(s) filed on 16 November 2005.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

## Disposition of Claims

- 4) ☒ Claim(s) 1-57 is/are pending in the application.
- 4a) Of the above claim(s) 24-33 and 54-57 is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-9, 12, 13, 17, 18, 20, 34-38 and 45-48 is/are rejected.
- 7) ☒ Claim(s) 7, 10, 11, 14-16, 19, 21-23, 37, 40-45 and 49-53 is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

## Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 02 October 2003 is/are: a) ☐ accepted or b) ☒ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

## Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
  - ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- \* See the attached detailed Office action for a list of the certified copies not received.

## Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)  
Paper No(s)/Mail Date 9/7/04.
- 4) ☐ Interview Summary (PTO-413)  
Paper No(s)/Mail Date. \_\_\_\_\_.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: \_\_\_\_\_.

## **DETAILED ACTION**

### ***Election/Restrictions***

Applicant's election without traverse of Species 1 (claims 1-23 and 34-53) in the reply filed on November 16, 2005 is acknowledged.

This election is accepted by the examiner and is therefore deemed final.

### ***Information Disclosure Statement***

The information disclosure statement filed on September 7, 2004, has been fully considered by the examiner, except for USPN 6,282,818. This patent number is directed at a reference for a post-operation shoe, and therefore, is not considered relevant to Applicant's disclosure. Examiner believes this should be USPN 6,262,818, directed towards a method for the numerical reconstruction of digital holograms which allows simultaneous amplitude and quantitative phase contrast imaging, and this has been included in the Notice of References Cited (PTO-892) form accompanying this office action.

### ***Drawings***

New corrected drawings in compliance with 37 CFR 1.121(d) are required in this application because they are informal and are illustrated with handwritten reference figures, handwritten labels and figure parts, handwritten figures (Figures 9A-9C), and figure captions (Figure 12C and 12D). Applicant is advised to employ the services of a competent patent draftsman outside the Office, as the U.S. Patent and Trademark Office no longer prepares new drawings. The corrected drawings are required in reply to

the Office action to avoid abandonment of the application. The requirement for corrected drawings will not be held in abeyance.

***Specification***

The disclosure is objected to because of the following informalities:

The phrase "Another component of the reflected beam 328" should be "Another component of the reflected beam 329" on page 6, paragraph 34, line 8.

Appropriate correction is required.

***Claim Objections***

Claims 7 and 37 are objected to because of the following informalities: The phrase "the reference beam" in line 2 of these claims should be removed.

Claim 22 is objected to because of the following informalities:

The first "wherein the" in the first line of this claim should be removed.

The phrase "the with" should be "with the" in the last line of this claim.

Claim 40 is objected to because of the following informalities:

The limitation "the adjusting the phase of the illumination beam" appears in this claim, and there is insufficient antecedent basis for this limitation in the claim.

Claim 45 is objected to because of the following minor informalities:

The phrase "A inspection apparatus" should be "An inspection apparatus" in the first line of this claim.

Appropriate correction is required.

***Claim Rejections - 35 USC § 102***

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

Claims 1-3 and 5-9 are rejected under 35 U.S.C. 102(b) as being anticipated by Massie (USPN 4,340,304).

In regards to claim 1, Massie discloses a method for inspecting a sample comprising:

illuminating at least a portion of a sample with an illumination beam to generate a reflected beam (column 4, lines 26-38);

interfering the first reference beam and the reflected beam to generate an interference pattern (column 4, line 66 to column 5, line 1);

recording the interference pattern (column 5, lines 1-3); and

comparing the recorded interference pattern with a comparison image to detect difference between the recorded interference pattern and the comparison image (column 6, lines 66 to column 7, lines 8).

Regarding claims 2 and 3, Massie's method comprises subtracting the recorded interference pattern from the comparison image and subtracting the comparison image from the recorded interference pattern. Massie compares the signals at detectors with stored signals to see if the signals are larger or smaller than the stored signals. In order to do this, the differences between the signal values must be found. (column 6, line 66 to column 7, line 8)

In regards to claim 5, Massie determines whether the differences between the recorded interference pattern and the comparison image exceed a predetermined threshold. If the recorded interference pattern signal is larger than the stored value (comparison image), then the recorded interference pattern replaces the stored value. This continues until the maximum threshold of the recorded interference pattern signal is achieved. (column 7, lines 3-8)

Regarding claim 6, the reference beam and the illumination beam of Massie's device can have a common phase. This is achieved by setting the phase shift of the device to zero. (column 5, lines 64-66)

In regards to claim 7, a component of the illumination beam comprising the reference beam (108) of Massie's device passes through a beam splitter (32). (column 4, lines 10-13 and 16-19)

Regarding claim 8, the reference beam (108) and the illumination beam (101) of Massie's device have a common source (14).

Regarding claim 9, the reference beam (108) of Massie's device reflects from a beam splitter (32) before interfering with the first image. (column 4, lines 19-25)

Claims 45-48 are rejected under 35 U.S.C. 102(b) as being anticipated by Pressesky et al. (USPN 5,999,261).

As to claim 45, Pressesky discloses an inspection apparatus for inspecting a sample comprising:

an illumination source (1) for providing an illumination beam at the sample (16) to generate a reflected beam (column 2, lines 38-41);

a reference module for providing first and second reference beams, the first and second reference beams being out of phase with each other (column 2, lines 60-65);

a first detector (D1, D2) aligned to detect a first interference pattern generated by at least a component of the reflected beam and the first reference beam (column 3, lines 17-20); and

a second detector (D3, D4) aligned to detect a second interference pattern generated by at least a component of the reflected beam and the second reference beam (column 3, lines 17-20).

Regarding claim 46, the first and second reference beams of Pressesky's device differ in phase by 90 degrees. (column 2, lines 62-65)

In regards to claim 47, Pressesky discloses the use of a beamsplitter (PBS 1) for reflecting one component of the illumination beam at the sample (16) and for permitting at least one other component of the illumination beam to pass through the beam splitter to the reference module. (column 2, lines 52-55)

Regarding claim 48, the reference module of Pressesky's device comprises a phase retarder (PCK1 and PCK2) disposed along an optical path of one of the two reference beams. (column 2, lines 62-65)

### ***Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 4, 12, 13, 17, 18, 20, and 34-39 are rejected under 35 U.S.C. 103(a) as being unpatentable over Massie (USPN 4,340,304).

Regarding claims 4, Massie does not disclose inspecting a sample comprising a portion of a wafer having a repeatable array of features. Massie discloses a method for inspecting a sample that can be used to detect defects in a desired contour on the surface of a mirror (column 1, lines 5-10). If a wafer has a repeatable array of features, the wafer exemplifies a sample with a regular desired surface contour. It would be inherent to use the device of Massie to detect defects in a wafer with a desired surface contour.

In regards to claims 12 and 34, Massie discloses a method for inspecting a sample comprising

illuminating at least a portion of a sample with an illumination beam to generate a reflected beam column 4, lines 26-38);

interfering a first reference beam and the reflected beam to generate a first interference pattern (column 4, line 66 to column 5, line 1);

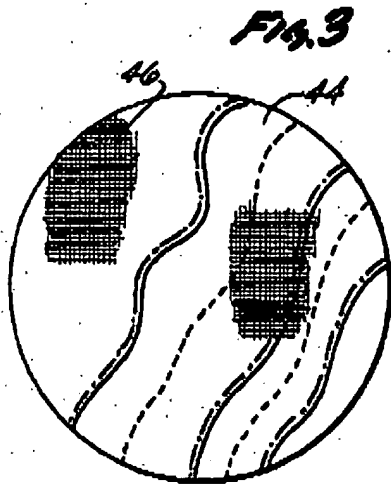
recording the first interference pattern (column 5, lines 1-3);

comparing the recorded interference pattern with a comparison image to detect difference between the recorded interference pattern and the comparison image (column 6, lines 66 to column 7, lines 8); and

adjusting a phase of the illumination beam to adjust a value between a first portion of the first interference pattern and a second portion of the first interference pattern.



Massie does not teach adjusting a contrast between a first portion of the first interference pattern and a second portion of the first interference pattern. Massie uses an array of detectors (46) to inspect separate portions of a test object, as shown in the figure below (column 5, lines 1-3).



Massie does teach comparing brightness signals achieved by the array of detectors during inspection as the phase shift between measurement cycles is changed. If the new signal value is larger than the stored signal value in a given detector, it replaces the stored value. (column 6, line 66 to column 7, line 8) This comparison allows for the brightest signal values to be kept during measurement cycles, and the brightest signal values will yield the strongest signals for the interference pattern. In turn, this results in an adjustment in contrast of the signal.

In regards to claim 13 and 35, the adjusting of the contrast provides optimal contrast between the first portion of the first interference pattern and a second portion of

the first interference pattern because it yields the maximum signal (column 7, lines 40-44).

Regarding claim 17, Massie discloses a method for inspecting a sample further comprising interfering a second reference beam and the reflected beam to generate a second interference pattern, the second reference beam having a different phase than the first reference beam;

wherein adjusting the phase of the reference beam further comprises adjusting the phase of the reference beam based on at least portions of the first and second interference patterns. (column 6, line 66 to column 7, line 8)

As the measurement cycles of Massie's device run, the phase shift of the beams is incrementally changed. During each of these changes, a new (i.e. second) reference beam is introduced with a different phase.

Regarding claim 18, Massie's device comprises detecting the first interference pattern at a first detector and detecting the second interference pattern at a second detector. Since the detector array of Massie's device is designed to take measurements at certain portions of the test object, a first interference pattern can be detected at one detector, and the second interference pattern can be detected at another detector after the beams are phase shifted. (column 4, line 66 to column 5, lines 1-3, and figure 3 above)

In regards to claim 20, Massie discloses the first reference beam having a same phase as the illumination beam and the second reference beam being 90 degrees out of phase with the illumination beam. Massie discloses changing the phase shift of the

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beams through a cycle from 0 to  $2\pi$  during measurement cycles. At one point during this cycle, the two beams will be 90 degrees out of phase with each other. (column 6, lines 46-48)

Regarding claim 36 and 38, the reference beam (108) and the illumination beam (101) of Massie's device have a common illumination source (14), and, therefore, a common source.

In regards to claim 37, a component of the illumination beam comprising the reference beam (108) of Massie's device passes through a beam splitter (32). (column 4, lines 10-13 and 16-19)

Regarding claim 39, the reference beam (108) of Massie's device reflects from a beam splitter (32) before interfering with the first image. (column 4, lines 19-25)

***Allowable Subject Matter***

Claims 10, 11, 14-16, 19, 21-23, 40-44, and 49-53 are objected to as being dependent on a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

The following is a statement of reasons for the indication of allowable subject matter:

As to claims 10 and 11, the prior art of record, taken alone or in combination, fails to disclose or render obvious a method for inspecting a sample with high aspect ratio structures with high aspect ratios in the range of about 1:1 to 12:1 by comparing a recorded interference pattern with a comparison image.

As to claims 14-16 and 40-44, the prior art of record, taken alone or in combination, fails to disclose or render obvious a method for inspecting a sample utilizing determining average intensity values for portions of interference patterns.

As to claims 19, 22, 50, and 51, the prior art of record, taken alone or in combination, fails to disclose or render obvious a method for inspecting a sample utilizing first and second reference beams that are polarized orthogonal to each other.

As to claims 21, 23, and 49, the prior art of record, taken alone or in combination fails to disclose or render obvious a method for inspecting a sample utilizing a polarizing beam splitter for receiving a component of an illumination beam and separating said beam into a first reference beam and an intermediate beam.

As to claims 52 and 53, the prior art of record, taken alone or in combination, fails to disclose or render obvious an inspection apparatus comprising polarizing elements disposed along an optical path associated with the reflected beam for laterally separating the reflected beam into two beams.

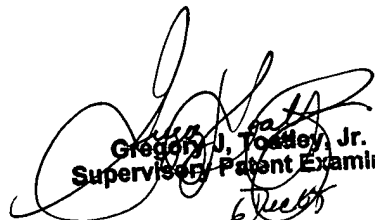
### ***Conclusion***

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Marissa J. Detschel whose telephone number is 571-272-2716. The examiner can normally be reached on M-F 8:30am-5:00pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Gregory J. Toatley, Jr. can be reached on 571-272-2059. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Marissa J Detschel  
November 29, 2005  
MJD



Gregory J. Tooley, Jr.  
Supervisory Patent Examiner